

MIO 0057 PA
Serial No. 09/904,112

-3-

The Examiner further asserts that Kunitomo et al. discloses a method where the first high dielectric constant oxide dielectric material is oxidized at a temperature from about 250°C to about 500°C using a gas plasma, where the gas is selected from the group consisting of O₂ and O₃ (as recited in applicants' claims 2-4). However, Kunitomo discloses that *either* a thermal or plasma treatment may be used for oxidation. See col. 2, lines 18-19. As one must be motivated to pick and choose from two different methods that are disclosed in Kunitomo, this negates anticipation. As well stated by the late Judge Rich in *In re Arkley*, 172 USPQ 524, 526 (CCPA 1972),

"Thus, for the instant rejection under 35 U.S.C. 102(e) to have been proper, the Flynn reference must clearly and unequivocally disclose the claimed compound or direct those skilled in the art to the compound without *any* need for picking, choosing, and combining various disclosures not directly related to each other by the teachings of the cited reference. Such picking and choosing may be entirely proper in the making of a 103 obviousness rejection, where the applicant must be afforded an opportunity to rebut with objective evidence any inference of obviousness which may arise from the *similarity* of the subject matter which he claims to the prior art, but it has no place in the making of a 102, anticipation rejection." [Emphasis in original.]

Further, applicants wish to point out that Kunitomo's thermal treatment may involve the use of high temperatures ranging from 650° to 850°C. As taught in the present invention, the deposition of layers at lower temperatures, i.e., from about 250° to about 500°C is desirable as it results in improved step coverage for three dimensional capacitor structures. See page 7, lines 5-28.

Further, Kunitomo et al. do not teach or suggest oxidation of both a conductive oxide electrode and a first layer of high dielectric material as recited in claim 1, from which claims 2-4 depend. Claims 2-4 are not anticipated by Kunitomo et al.

MIO 0057 PA
Serial No. 09/904,112

-4-

(m) The Examiner further asserts that Kunitomo et al. teach a method where the second layer of high dielectric constant oxide dielectric material is oxidized by rapid thermal oxidation at a temperature of less than about 700°C in the presence of a gas selected from O₂ and N₂O as recited in applicants' claims 22-24. The Examiner refers to col. 18, line 45, through col. 19, line 45. However, applicants note that Kunitomo et al. teach a treatment temperature of 700 to 850°C when using O₂ and a temperature of 650 to 850°C when using N₂O, both of which are outside applicants' claimed temperature of less than about 700°C. Further, Kunitomo et al. do not teach or suggest oxidation of both a conductive oxide electrode and a first layer of high dielectric material as recited in claim 15, from which claims 22-24 depend. Claims 22-24 are not anticipated by Kunitomo et al.

The Examiner further asserts that Kunitomo et al. disclose a method in which a field effect transistor having a pair of source/drain regions is provided which electrically connects one source drain region with the conductive oxide electrode and the other source/drain region with a bit line as recited in claim 100. However, as pointed out above, Kunitomo et al. do not teach or suggest oxidizing a conductive oxide electrode and first layer of high dielectric constant oxide dielectric material as claimed.

Accordingly, claims 1-6, 15, 22-30, 37-42, 45-49, 74-76 (as amended) and 100-105 are clearly patentable over Kunitomo et al.

() Claims 8-12, 43-44, 50, and 57-61 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kunitomo et al. in view of Joo, U.S. Patent No. 5,879,957. While the Examiner concedes that Kunitomo et al. do not teach oxidizing the upper layer electrode as claimed, he has cited Joo for disclosing a "method of oxidizing an upper layer electrode utilizing gas plasma," referring to col. 4, lines 46-56. However, applicants could find no teaching of oxidizing an *upper* layer electrode using a gas plasma as claimed. Rather, Joo teaches a plasma oxidation method for forming a RuO layer 36 on Ru layer 35, which layers together comprise a *lower* electrode. See col. 4, lines 12-14. And, there is no teaching or suggestion in Joo of oxidizing the upper electrode (Pt layer 41).

MIO 0057 PA
Serial No. 09/904,112

-5-

Further, applicants wish to point out that neither Kunitomo et al. nor Joo teach oxidizing the conductive oxide electrode *and* first layer of high dielectric constant oxide dielectric material as recited in independent claims 8, 11 and 50. Accordingly, Kunitomo et al. and Joo cannot be combined in the manner proposed by the Examiner, and even if combined, the teachings of Kunitomo and Joo do not meet applicants' claims.

Claims 11-12 and 62-63 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kunitomo et al. and Joo in view of Kingon et al., U.S. Patent No. 5,555,486. The Examiner acknowledges that neither Kunitomo nor Joo et al. teach forming a gas permeable electrode on an upper layer electrode as claimed, but asserts that Kingon et al. disclose a method of forming a platinum electrode on an upper electrode in order to reduce leakage current, referring to col. 6, lines 38-45. However, what Kingon et al. actually teach is an upper electrode which *contains* Pt as part of a hybrid structure, i.e., Pt/RuO₂, etc. There is no teaching or suggestion in Kingon et al. of forming a gas permeable (Pt) electrode *on* an upper electrode as claimed. Nor is there any teaching or suggestion in Kingon et al. of depositing a gas permeable electrode on an upper layer electrode and then oxidizing the upper layer electrode as recited in independent claim 11 and dependent claims 12 and 62-63.

Further, neither Kunitomo et al., Joo, nor Kingon et al. teach or suggest oxidizing a conductive oxide electrode and a first layer of high dielectric constant oxide dielectric material as recited in independent claim 11 and independent claim 50, from which claims 62-63 depend.

Finally, in response to the Examiner's indication that claims 73 and 77-79 are substantially duplicative of claims 1-4, claims 73 and 77-79 have been cancelled. Claims 74-76 have been amended so that they now depend from claim 1.

MIO 0057 PA
Serial No. 09/904,112

-6-

For all of the above reasons, applicants submit that claims 1-6, 8-12, 15, 22-30, 37-50, 57-63, 74-76 and 100-105, as amended, are patentable over the cited art of record. Early notification of allowable subject matter is respectfully solicited.

Respectfully submitted,

KILLWORTH, GOTTMAN, HAGAN &
SCHAEFF, L.L.P.

By Susan M. Luna
Susan M. Luna
Registration No. 38,769

One Dayton Centre
One South Main Street, Suite 500
Dayton, Ohio 45402-2023
Telephone: (937) 223-2050
Facsimile: (937) 223-0724

FAX COPY RECEIVED

SEP 23 2002

TECHNOLOGY CENTER 2800

MIO 0057 PA
Serial No. 09/904,112

-7-

APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE
IN THE CLAIMS

28. (Amended) A method of forming a capacitor comprising providing a conductive oxide electrode, depositing a first layer of a dielectric material comprising Ta_2O_5 on said conductive oxide electrode, treating said conductive oxide electrode and said dielectric material under oxidizing conditions such that both said conductive oxide electrode and dielectric material are oxidized, depositing a second layer of a dielectric material comprising Ta_2O_5 on said first layer of said dielectric material, oxidizing said second layer of said dielectric material, crystallizing said second layer of said dielectric material, and depositing an upper layer electrode on said second layer of said dielectric material.

74.(Amended) A method as claimed in claim [73] 1 wherein said high dielectric constant oxide dielectric material is selected from the group consisting of Ta_2O_5 and $\text{Ba}_x\text{Sr}_{(1-x)}\text{TiO}_3$.

75.(Amended) A method as claimed in claim [73] 1 wherein said conductive oxide electrode is selected from the group consisting of RuO_x and IrO_x .

76.(Amended) A method as claimed in claim [73] 1 wherein said upper layer electrode is selected from the group consisting of RuO_x and IrO_x .